

[STRUCTURES WHICH CAN BE DISMANTLED AND FOLDED,
CONSISTING OF INTERCONNECTING TUBULAR ELEMENTS]

5

BACKGROUND OF THE INVENTION

^{This}
[The present] invention relates to folding structures consisting of interconnected
extended tubular elements. More particularly, ^{this} [the present] invention relates to
portable folding structures which can be extended horizontally or vertically, that
10 can be used for product display or as supports for raised loads, such as for instance
platforms, walkway bases, technical pavements, rostrums, stands, boxes,].
^{These structures comprise}
[comprising] a plurality of interconnected parallelepiped cells in which the sides
faces of the parallelepiped are defined by a pair of tubular elements interconnected
by a scissors-connector. In these structures ^{each} each extremity of the extended tubular
15 elements which constitute the pair of scissors-connected elements, is inserted by
rotation into a seat in an articulated universal joint, also parallelepiped in form.
The universal joint presents, on one of the larger faces, a hinging seat
corresponding to each side face, and can therefore accept up to four extremities of
tubular elements. In the case of structures that must bear heavy loads ^a a variation
20 to the embodiment described above has been used for some time in which the
universal joints provide for a fifth seat on the surface of said face into which is
fixed a tubular element, within which another tubular element of smaller diameter
is inserted as a sliding fit and whose extremity is inserted into the face of a similar
universal joint. The tubular element inserted into the face of the universal joint is

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fixed and is stopped against the opposed joint into which is inserted the extremity
^{the} of element that slides inside.

It is often necessary to arrange for exhibition structures or raised support higher
 than is attainable with the single structure. In this case, more identical (or similar)
 5 structures are superimposed such that, in the overlap, the upper faces of the
 universal joints of the underlying structure are matched to the corresponding lower
 faces of the upper structure.

Devices are known to increase the height of the exhibition or support systems
 mentioned above. For instance, an exhibition system that could give rise to
 10 structures of different height is described in ^{European Patent} EP-A-0 419 006.

The structure described in ^{this} [said] patent is complex, provides for a plurality of
 articulated elements and therefore requires long assembly and dismantling times.

The system proposed in ^{European Patent} [the] EP-A-0 884 425 provides for uniting the joints of two
 structures by connecting the extremities of the two telescopic elements, for
 15 instance by means of screw or pin systems.

This system also presupposes complex and onerous setting-up operations, as well
 as relatively long dismantling and assembly times.

It is one object of this ^{SUMMARY OF THE INVENTION} to provide
 [One purpose of the present invention] is provision of a simple and rapid method of
 joining two or more structures of the type ^{comprising} [consisting of] pairs of extended tubular
 20 shear-connected elements, whose extremity is hinged in universal joints and in
 which the universal joints are defined integral with equal and parallel larger faces
 and are preferably substantially parallelepiped in form and present four hinging
 seats set in one of the larger faces near a side face.

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It is another object of this ^{to provide a means for}
 [A second purpose of the present] invention [is the] coupling [of] two or more
 superimposed structures of the type described above that furthermore present in
 the inside surface of the face of the universal joint, in which are seats for the
 hinging of the extended elements, a fifth seat into which is fixed the extremity of
 5 an extendible telescopic tubular element whose other extremity is fixed to the
 opposite underlying universal joint.

^{It is yet another object of this to provide}
 [And a further purpose of the present] invention [is] a device that allows the coupling
 of the aforesaid structures.]

^{These and other objects addressed}
 [The purposes of the present invention] are [achieved] using the universal joints
 10 described above that ^{form} [present] grooves along the sides of the face, in which are
 scheduled seats for lodging the extended elements in proximity to the edges of the
 type and parallel to the same edges, that cooperate with C-sectioned fixing
 elements to hold two matching universal joints belonging to two superimposed
 structures together.

^{this}
 15 According to a preferred embodiment of [the] invention, the C-shaped fixing
 elements are substantially rectangular sheets of flexible material with two opposite
 edges folded and inverted, ^{herein} [in the following] also referred to as the C-shaped spring
 or C-spring. The folded and inverted edges of the C-shaped spring present
 dimensions and forms corresponding to those of the grooves cut into the faces of
 20 the universal joints.

^{a substantial portion}
 The C-shaped springs with inverted edges cover [most] of the corresponding side
 faces of the superimposed universal joints and they could provide for, in some

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cases, grooves in correspondence with seats of lodgement of the extended elements and they could take different configurations depending on their use.

The C-shaped springs ^{can} [could] be applied to all the side faces of all the joints that are matched in the overlap or in coupling of multiple structures.

- 5 It has been found, however, that to get sufficient stability ⁱⁿ in most cases it is sufficient to apply the C-springs only on the external faces of the universal joints that are on the external surface of the structure. The application of the C-springs to only the external faces of the joints enormously simplifies the operation of assembly and dismantling of the coupled structures.

- 10 To further guarantee the stability of the joined structure, the faces of the matching joints ^{can form} [could present] one or more suitable perforations for the housing pivots that prevent any movement of the joints on the contact pivot.

BRIEF DESCRIPTION OF THE DRAWINGS of this invention
 [The present invention will now be illustrated in more detail making reference to these and other objects and features, will be better understood from the following detailed description taken in conjunction with the preferred embodiments of the same that are described with the aid of the attached drawings, which only should not be interpreted as limiting the invention wherein.]

- 15 drawings [These sketches and the embodiments are by way of example and [must] should not be interpreted as limiting the invention wherein.]

[In the sketches:]

[figure 1] ^{Fig. 1} shows a view in perspective of a universal joint [in accordance with one of the embodiments of this invention;

- 20 [figure 2] ^{Fig. 2} shows a side view of [the] ^a C-sectioned spring [suitable for use that could cooperate] with the joint of figure 1; ^{Fig. 1}

[figure 3] ^{Fig. 3} is a view in perspective of the spring of figure 2; ^{Fig.}

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Fig. 4
[- figure 4] shows a side view of two joints belonging to two superimposed structures fixed together by means of the springs of figures 2 and 3.

Fig. 5
[- figure 5] is an exploded view of a preferred system of connection of structures in accordance with one embodiment of this according to the invention; and

Fig. 6
5 [- figure 6] is a simplified scheme of two superimposed structures coupled one embodiment of this according to invention.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

With reference to figures 1 to 4, the universal joint 1 forms four grooves 2, 2', 2'' and 2''' on one of its larger faces in correspondence with each side face, that can accept hinged extended tubular elements not shown in the figure. On face 3 of the universal joint that forms the four grooves (2, 2', 2'' and 2''') there is an opening (shown in Fig. 4) 4 to fix the extremity of a tubular extended element 5, within which another tubular element slides, not shown in the figure and connected with a corresponding universal joint. Along the edges of the face of the universal joint form are grooves 6 which constitute seats to accept one of the extremities 8 of a spring 9 as shown in figure 4.

The insertion of the two extremities 8 of the spring 9 into the grooves on the non-matching faces of two joints belonging to two superimposed structures allows the coupling of the structures to be maintained fixed. The insertion of the springs is easily achieved after the structures have been superimposed by snapping the inverted extremities 8 of the springs 9 into the grooves, where they remain locked. The operation of dismantling is performed quickly, for instance, by removing one of the two inverted extremities 8 of the C-springs from the groove.

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Fig.
[Figure] 5 shows a preferred embodiment of ^{this} [the] invention. ^{which} This provides for the use of universal joints whose face opposite to that in which the grooves have been made contains the opening 10 that can accept pivots 11 that prevent any relative movement of the joints in the horizontal plane.

5 Fig.
[Figure] 6 shows a side view of a support system for elevated loads according to ^{one embodiment} [the] ^{of this} invention, obtained by joining two structures.

The said figure shows the extended elements 12 joined with scissors-connection and hinged in seats 2 of the universal joint, as well as the telescopic extension elements 5, that assure resistance to loading of the structure.